Knowledge Organiser – Textiles KS4 Fibres & fabrics

Natural fibres from plants

Cotton

Used for making jeans, T-shirts and towels and has the following qualities:

- cool to wear
- very absorbent, dries slowly
- soft handle
- good drape
- durable
- creases easily
- can be washed and ironed

Natural fibres from animals

Wool

Used for jumpers, suits and blankets and has the following qualities:

- warm to wear
- absorbent, dries slowly
- breathable, repels rain
- soft or coarse handle
- can shrink, should be dry cleaned
- good drape
- not durable
- creases drop out

Silk

Used for evening wear and ties and has the following qualities:

- warm to wear
- absorbent
- soft handle
- good lustre and drape
- durable
- creases drop out
- dry clean

Man-made/synthetic

Viscose

A regenerated fibre from natural polymer materials like cellulose. It is used for shirts, dresses and linings and has the following qualities:

- low warmth
- absorbent, dries slowly
- soft handle
- good drape
- not durable
- creases easily
- can be washed and ironed

Nylon (Tactel)

Used for active sportswear, fleece jackets, socks and seat belts and has the following qualities:

- warm to wear
- absorbent, dries slowly
- breathable, repels rain
- soft or coarse handle
- can shrink, should be dry cleaned
- good drape
- durable
- creases drop out

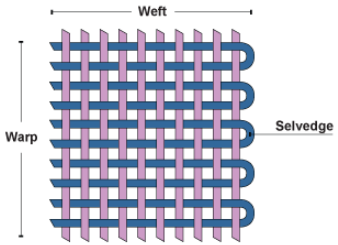
Polyester

Used for raincoats, fleece jackets, children's nightwear, medical textiles and working clothes and has the following qualities:

- low warmth
- non-absorbent, dries quickly
- soft handle
- good drape
- very durable
- crease resistant
- easy care
- can be recycled

Woven fabrics

Woven fabrics are made up of a **weft** - the yarn going across the width of the fabric - and a **warp** - the yarn going down the length of the loom. The side of the fabric where the wefts are double-backed to form a non-fraying edge is called the **selvedge**.

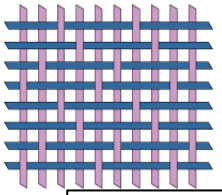


In plain-weave fabric the warp and weft are aligned so that they form a simple criss-cross pattern. Plain-weave is strong and hardwearing, so it's used for fashion and furnishing fabrics.

Weft-knitted fabrics

Weft-knitted fabric is made by looping together long lengths of yarn. It can be made by hand or machine. The yarn runs in rows across the fabric. If a stitch is dropped it will ladder down the length of the fabric. The fabric is stretchy and comfortable and is used for socks, T-shirts and jumpers.

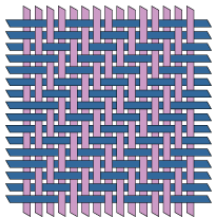
Satin-weave fabric



In satin-weave fabric there is a complex arrangement of warp and weft threads, which allows longer float threads either across the warp or the weft. The long floats mean the light falling on the yarn doesn't scatter and break up, like on a plain-weave.

The reflected light creates a smooth, lustrous (shiny) surface commonly called satin. The reverse side is invariably dull and non-shiny. Weave variations include jacquard and damask.

Twill-weave fabric



In twill-weave fabric the crossings of weft and warp are offset to give a diagonal pattern on the fabric surface. It's strong, drapes well and is used for jeans, jackets and curtains.

Non-woven fabrics

Non-woven fabric is made by **bonding** or **felting**.

Bonding

Bonded-fibre fabrics are made from webs of synthetic fibres bonded together with heat or adhesives. They are cheap to produce but not as strong as woven or knitted fabrics. Bonded-fibre fabrics are mainly used for interlining. They are easy to sew, crease resistant, do not fray and are stable when washing and dry cleaning.

Felting

Wool felt is a non-woven fabric made from animal hair or wool fibres matted together using moisture, heat and pressure. Felt has no strength, drape or elasticity but it is warm and does not fray. Wool felt is expensive. It is used for hats and slippers and in handcrafts.

Fibre blends

Blending different fibres together produces yarns that have the combined properties of each component fibre. Using fibre blends improves the appearance, performance, comfort and aftercare of fabric. Blending can also reduce the cost of an expensive fibre.

- **Polyester/cotton blend**: shirts are more easy-care and crease-resistant than shirts made from 100 percent cotton.
- **Cotton/lycra blend**: jeans are more comfortable, stretchy and fit better than cotton jeans.
- **Acrylic/wool blend**: trousers are less expensive than 100 percent wool trousers.

Modern microfibres

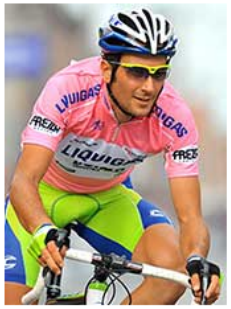
- **Elastane (Lycra)** is always used in a blend with other fibres. It is used to make sportswear, body-hugging clothes and bandages. It has good handle and drape, is durable, crease resistant, stretchy (more comfortable) and is easy care. It has low warmth and is absorbent.
- **Tencel** is a 'natural' microfibre made from cellulose derived from wood-pulp. It is used for shirts and jeans. It has soft handle, good drape, is breathable, durable, crease-resistant, easy-care and biodegradable. It is absorbent and has low warmth.

Properties of fabric

Aesthetic properties	Functional properties	Comfort properties
handle drape colour appearance	strength durability crease resistance flame resistance stain resistance water resistance aftercare cost	absorbency breathability elasticity softness stretch warmth

It is important to match fabric properties to the requirements of the product. For example:

- **Cycling jackets** need to be made from fabric that is warm, breathable, elastic, windproof and water resistant.
- **Children's jumpers** need to be made from fabric that is soft, colourful, stretchy, warm and easy care.
- **Seat belts** need to be made from strong, durable, flame-resistant materials.
- **Fire-protective clothing** needs to be strong, durable, flame resistant and water resistant. It may also need to be breathable and elastic.
- **Geotextiles** need to be strong and durable so they stop embankments from slipping.



Cycling jerseys need to be breathable

Finishing

Finishing is done to improve the appearance, properties and quality of a product. It covers many different processes, some mechanical and some chemical.

Smart Fabrics – react to the environment

Scotchlite reflective fabric - silvery effect, shines when a car's headlights reflect on the surface. Excellent for road runners, children walking to school in winter etc.

Microfibre - breathable, windproof & shower proof. Let's moisture out of the body and not into the body.

Chromatic dyed fabric - changes colour at certain temperatures, can be used for firefighters to warn of unsafe temperatures. Used on T-shirts in 1990s to show when sun was too hot/risk of sunburn.

Knowledge Organiser – Textiles KS4 Manufacturing

Production

Job production / one off - Only one item is made, e.g. individually designed wedding dress, costume for a theatre show.

Batch production - Many identical items are made, e.g. school uniform.

Mass production - Very many identical items are made, e.g. shirt sold at M&S.

Continual flow - Production is non-stop, machines work 24/7. Used for simple products like making bandages. Unusual in textiles manufacture.

Costs - Fabrics, components (e.g. thread, buttons), labour (not just machinists, office staff, designers, cutters etc.), power (electricity), rent.

Standard minutes - How long it takes for a product to be manufactured, this helps to work out costs (labour).

Specifications

Design specification

Must not be to do with the fabric (e.g. lightweight fabric).

Good examples related to your theme would be:

- Big enough to fit .....
- Have compartments suitable to store .....
- Be suitable for / appeal to age.....
- Suitable for males/females/ unisex.
- Be adjustable to fit a variety of different sized people.
- Be comfortable for the wearer.
  - Colour which will not look dirty quickly.
  - Colour to match current fashion trends
- Washable
- Soft, comfortable fabric
- Hard wearing / durable
- Easy care / no need to iron
- Should not fray

Manufacturing specification

- Working drawing - line drawing without colour, includes measurements, including tolerances.
- Fabrics & Components to be used.
- Delivery date
- Flow chart - start & finish round boxes: process rectangle: decision diamond: check triangle.
- Gantt chart - production schedule
- Care label
- Equipment to be used & risk
- Photograph of product

Jobs: Designer- designs products. Pattern cutter- works out the pattern templates. Sample machinist- makes prototype. Cutter- cuts fabric. Machinists- sew product together. Presser- presses & irons product. Qualify controller- checks product matches specification & is up to standard.

Quality Assurance - Procedures set up to prevent problems from occurring.

Quality Control - Checks product is OK.

CAM - Computer aided manufacture. Machines can be programmed to sew, e.g. computerised embroidery machines. CNC (computerised numerical control) machines can sew pieces together - item is put into a frame & the machine is programmed using coordinates to sew specific sections.

CAD - Computer Aided Design. Can try different colourways, adaptations of a design, e.g. try with long sleeves, short sleeves etc., designers have the opportunity to use 'virtual catwalk' can see the product from all angles, being worn by a virtual model.

Other uses of ICT in textiles industry - office type ICT, costing, deliveries, wages etc. Email to show clients possible ideas, Websites to attract custom.

Methods of production:

Just in time - components & fabrics arrive just in time to be made. Stock isn't lying around cluttering space. Less likely to be wasted fabrics and components.

Production line - one person does one job, it then goes to the next person for the next stage.

Team working system - Small team produces a whole garment themselves, workers are multi-skilled. Not repetitive work.

Specialist machines:

Spreading machines - spread fabric flat onto tables.

Vacuum tables - fabric is spread on tables, and the air sucked out to squash the fabric together.

Die cutters - (like biscuit cutters) metal shapes which are pressed through the layers of fabric to cut out product.

Band saws - cut through many layers of fabric at a time. Operators wear metal chain gloves to protect them from getting cut.

Computer driven knives / saws - cutter is programmed to cut through the fabric.

Hot notcher - Makes notches in the side of a stack of cut out pattern piece. The notches help to match up which pieces go together.

Thread marker - shoots a bright thread through the stack of cut out pattern pieces - it is used in place of tailor's tacks, e.g. for marking dart points.

Industrial sewing machines - Most look like normal sewing machines, but may be specially designed or have attachments which make it easier and more accurate to perform the same repetitive task, e.g. it may have an attachment which feeds elastic through at a certain rate as the item is being stitched. The machines are very fast, many have automatic thread cutters, so the machinist doesn't have to cut the thread at the end of the task. Some machines are very specialised and cannot be used for anything other than 1 function, e.g. overlocker, buttonhole machine (stitches and slits the buttonhole to the correct size), bar tack machine (stitches a really strong, close together 'bar', often used at the top of jeans pockets). See notes above on CNC machines.

Computerised embroidery machines - very fast, there is a needle for each colour of thread. So they have attachments to fit odd shapes, e.g. baseball caps.

Flat bed press - looks like a photocopier, item is placed on the press, the lid is lowered and it presses flat with heat.

Steam dolly - a bit like a metal stick-man, the item is put on the steam dolly, then steam is forced from the dolly so it steams the whole item from the inside out.

Mechanical finishing processes

Mechanical finishing uses heat, pressure and rollers to improve the appearance of the fabric.

Brushing

Brushing cotton or nylon fabrics makes them fluffy and warm, with a soft handle. The fabrics pass through rollers with wire brushes that lift the fibres to form a nap.

Calendering

Calendering is the industrial equivalent of ironing. It smoothes the fabric and improves its lustre. Engraved calendar rollers are used to emboss relief patterns on the fabric surface.

Heat-setting

Heat-setting is used for thermoplastic fabrics (polyester and nylon). The fabrics are set in permanent shapes or pleats.

Chemical finishing processes

Chemical finishing involves the application of chemical solutions or *resins* to improve the appearance, handle or performance of a fabric.

Bleaching

Cotton and synthetic fabrics are bleached before dyeing. This makes it easier to dye pastel shades.

Mercerisng

Cotton or linen fabrics are mercerised using the alkali caustic soda. Mercerised fabrics are stronger, dye well and have improved lustre.

Shrink resist

Wool can be given a shrink-resist finish using silicone or Teflon. This results in soft, smooth, lustrous yarns and fabrics that are machine washable.

Crease resist

Cotton and viscose fabrics are given a crease-resistant finish using *resin*. This makes them easy care. They dry fast and smooth and need little ironing.

Flame resistant

Children's nightwear and cotton/viscose furnishings must by law be given a *flame-resistant* finish. This often makes the fabric stiffer and weaker.

Anti-bacterial finishes

Anti-bacterial finishes are applied to the fabric surface to slow down the growth of bacteria. They control odours in sports shoes and reduce infection in medical products.

Coating

Coating involves applying a layer of polymer to the surface of the fabric. Teflon coating makes fabrics *stain resistant*, *water repellent* and *breathable*

Biological finishes

Biological finishes use natural *enzymes* to change a fabric's appearance. **Bio-stoning** gives a stone-washed finish to denim fabrics.

Thermochromatic finishes

Thermochromatic substances change colour due to a change in temperature.

Health and safety at work

The other aspect of safety you need to know about is the law covering the health and safety of those working in textiles production. The most important piece of legislation is the **The Health and Safety at Work Act (1974)**.

The Act makes it a legal requirement for manufacturers to undertake a *risk assessment* of all the stages of product manufacture, to ensure the **safety of workers and prevent industrial accidents**. The Act specifies that:

- safety procedures must be displayed for all to see
- workers must be trained to use machines and equipment
- appropriate protective clothing must be worn
- all risks must be controlled and monitored

Workshop safety

A **risk assessment** considers all the risks that are present and identifies steps to reduce the risk.

Safety with people

- follow safety rules
- use chemicals in well-ventilated areas and use a mask when needed
- keep flammables in a locked cupboard, away from children and heat
- tie back long hair
- only one person at a machine at a time
- don't crowd people using machines or hot wax

Safety with materials

- wear protective gloves if using dyes, solvents and toxic substances when dyeing, printing or painting fabric
- take care with hot wax used for batik
- keep workshop clean and tidy

Safety with machines

- keep hands away from sharp blades on CADCAM cards, vinyl cutters and scissors
- turn off sewing machines and irons after use
- wear safety goggles where needed
- wear goggles when using a CNC laser cutter and do not look directly at the laser beam
- put tools away after use

CAD is any designing done using or with the help of a computer.

CAM The making of textile products where the machine is controlled by the computer.

Knowledge Organiser – Textiles KS4 Fabrics and Decorative techniques

Some fabrics which would be good to learn

Fabric name	Fibre	Construction	Qualities
Jersey	Any, but usually cotton or polyester	Knitted	Soft, stretchy, doesn't fray
Poplin	Polyester & Cotton	Plain weave	Lightweight (school shirt), easy care, washable, doesn't crease badly
Gingham	Usually cotton, sometimes polyester & cotton.	Plain weave	Lightweight, comes in a variety of check sizes.(school shirt), easy care, washable, doesn't crease badly
Velvet	Cotton	Pile wave	Soft, furry texture, sumptuous, washable
Satin	Acetate or polyester	Satin weave	Shiny, lustrous, looks expensive, frays badly

Dyeing

Before dyeing and printing the fabric is prepared by **washing**, **bleaching** and **mercerising**, in which the yarn is treated to improve strength, lustre and receptivity to dye. Fabrics can be **dyed** by hand or by machine.

Printing

Block printing

Block printing is done using metal or wooden blocks, one for each colour. The background shapes are cut away to leave a raised design on the block. Dye is applied and stamped onto the fabric. This is a slow process used by specialised craft industries.

Screen printing

In screen printing a pattern is printed onto fabric through a **stencil** held in place by a screen. Each screen prints one part of the design in one colour. After printing the dyestuff must be fixed using **steam** or **dry heat**.

Appliqué

Pattern / decoration is applied to the fabric by cutting out pieces of coloured fabric and stitching them onto the background. The edges of the fabric are usually neatened with a satin stitch (zig-zag with a very small length, 0.2 - 0.5mm, the width can be as wide as is needed for optimum effect, most average about 4mm). Some fabrics such as felt do not need neatening as they do not fray, but a satin stitch may still be used to add to the effect.

Applique method:

- Pin pattern onto the fabric. • Cut out.
- Pin (& tack if necessary) to background fabric.
- Stitch close to edge with straight stitch (length 2.5mm, width 1Omm).
- Finish off with a satin stitch to seal the edges to prevent from fraying.

Transfer Adhesive (trade name Bondaweb) Method

- Iron transfer adhesive (sticky side down) onto coloured fabric.
- Draw pattern onto paper side of transfer adhesive (reverse image).
- Cut out and peel-off the paper.
- Position & iron (set to correct temperature for fabric) onto background fabric. Finish off with a satin stitch to seal the edges to prevent from fraying.

Reverse appliqué method:

- Pin at least 2 different pieces of the same sized fabric together.
- Using a straight stitch, stitch the design onto the layers of fabric.
- Using sharp scissors, cut away the required number of layers of fabric to expose the chosen fabric.
- Finish off with a satin stitch to seal the edges to prevent from fraying.

Resist Techniques

Tie Dye

- Traditional technique
- Fabric is folded and tied with string or elastic bands to stop dye getting to the fabric.
- Used on Natural fabrics
- Can add buttons or pebbles to create interesting effects.

Batik

- Traditional technique using natural fabrics.
- Resist dyeing where the wax stops the dye reaching the fabric.
- Hot wax applied with a paint brush, Tjangting or stamp to create a design.
- Colour layered to produce the design.
- Wax removed by ironing between newspaper or putting the fabric in boiling water.

Other techniques:

- Patchwork
- Quilting
- Embroidery
- Hand embroidery
- Sewing machine embroidery
- Free machine embroidery
- CAD/CAM embroidery
- Beading/sequins
- Shisha mirror

Components

Components are pre manufactured items added to textile products that are not the fabric.

Components can be **functional** eg. zip, velcro or **decorative** eg. fringed edging, sequins.
Examples of components that you could add to your designs:

Thread -Sewing up products, decoration. Comes in different sizes and fibres - embroidery silks, metallic thread, sewing thread.

Interfacing (Vilene) - Strengthening and stiffening fabric. Sew in or iron on. Non woven. Used in collars and cuffs, to reinforce embroidery.

Wadding - Used as flat padding for quilting. Often used to pad playmats and jackets. Insulates and retains warmth.

Bias binding - Used on the edges of products to cover raw edges and create a decorative effect.

Other items that are components are: zips, press studs, hook and eye, ribbon, buttons, sequins, eyelets, lace, toggles, pompoms, fringing etc.

Societal, cultural, and moral factors that impact on textile design

Societal / cultural / moral factor	Impact
Lifestyle and fashion Gender images and peer group pressure. Clothing, accessories and styling of fashionable celebrities. Brand loyalty.	Development of new street fashions, style and colour trends. Development of new marketing strategies.
Trend forecasts Available as a commercial service aimed at fashion industry professionals worldwide. Retail organisations, manufacturers, designers and consultants frequently subscribe to keep up to date.	Various professional **trend forecast services** judge and identify emerging trends and predict future trends. Fashion industries can find guidance as to the lengths, shapes, colours and styles of garments and accessories to be designed and made.
Globalisation Availability of cheap labour in the developing world. New global market for textile fashions. Increasing awareness of textiles from other cultures. Consumer reaction against corporate trends.	Textiles costs are driven down in a global marketplace for textiles. Growing demand for traditional and ethnic textiles as well as modern ones.
Environmental concern Worries about pollution of rivers and beaches from textile processes. Growing support for recycling.	Development of new recycled fabrics (eg Polartec, Tencel). Preference for higher-cost traditional fabrics (eg wool) over synthetic ones. Enforcement of laws to protect the environment.

Packaging

- Textiles companies are trying to reduce the use of packaging in order to make the Textiles industry more environmentally friendly.
- Packaging should be recyclable or biodegradable (rot away)

Waste from Textiles Processes

- Dyeing produces contaminated water and poisonous chemicals, it also uses energy to heat water and power machines.
- To reduce waste the dying industry could use natural dyes or cold water dyes to reduce chemicals and energy costs.
- Finishing of fabrics uses a lot of different chemical in the processes which are a hazard to the environment.
- Waste from production processes should be reduced to prevent it going to landfill.

Laundry and Aftercare of Textiles

- Washing textile products has a huge impact on the environment – use of energy powering the machines and heating water, detergents going into the drains and chemicals used in Dry cleaning.
- Solutions are to wash at lower temperatures, avoid dry clean only and to use non bio detergents.
- You should always buy an A rated washing machine as these are more efficient and save energy.

Transportation Costs

Products made abroad in countries such as India and China have to be shipped back to the UK to be sold.
The shipping of these products causes pollution and damage to the environment whether it is by air or sea.
Despite the cost of shipping it is still cheaper to produce clothing abroad than in this country.

Social & Environmental issues

Proper leather and suede involve removing the skin from animals, therefore morally it may be seen as unkind to animals. Even silk involves killing a caterpillar! Synthetic fibres use oils & chemicals, again not very good for the environment. However, pesticides are used on large cotton plantations and these are also bad for the environment. Wool would seem a good idea as no sheep are harmed - however some people (like me) are allergic to it! Dyes are also harmful to the environment, particularly is unscrupulous manufacturers dispose of excess dyes in rivers. Transfer printing is environmentally friendly as it doesn't involve washing away dyes. Fibres such as Synchilla (made from fizzy pop bottles) would be excellent as it means the bottles which would fill landfills are recycled. It is also possible to buy 'Organic Cotton' which doesn't use pesticides.

Labelling

Information commonly found on labels on textile products.

- **Fibre content** - listed in order of the highest fibre content first.
- **Country of origin** - tells you where the product was made.
- **Product details** - type, size and style of garment.
- **Safety advice** - Used especially on childrens toys or clothing. 'Keep away from fire' 'For children 36 months and over'. The CE mark and Lion mark show that a product meets safety standards.
- **Retailers logo** - Retailers store and product number used for tracing products if they have a fault.
- **Barcodes** - Used to track the movement of the garment from the factory to the shop.
- **Care labels** - how to look after your product to keep it looking good Washcare labels
- **Environmentally friendly**, cruelty free, recyclable or Fairtrade - The label will often say if the garment was ethically produced.